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The Best Predictors Of Self-Reported Depressed Mood In Adolescents

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The Best Predictors of Self-Reported Depressed Mood in Adolescents

BY

Melissa H. Wineberg

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Abstract

The present study examined multiple predictors of depression simultaneously in order to determine which variables best predict self-reported depressed mood in adolescents. Although the current literature has identified several individual variables and their relationship to depression in adolescents, few studies have investigated multiple variables at the same time in relation to depression. Participants included 4,693 high school students from a Midwestern state. Of these students, 47% were girls, 47% were boys, and 6% did not indicate their gender. These students attended various high schools across seven counties and were recruited for a health prevention program called *I Sing the Body Electric.* As part of the program, students completed a confidential survey that evaluated a number of health related issues, including depressed mood and other variables that have been found to be predictors of depression. The current study used some of the data from this data base. Logistic regression analyses using a forward selection procedure indicated that the top four predictors of self-reported depressed mood in adolescents are dating violence, cyberbullying, eating disorder symptoms, and school belonging. These findings are inconsistent with existing literature and have implications for prevention and intervention programs, as well as future research directions, which are discussed in detail.

The Best Predictors of Self-Reported Depressed Mood in Adolescents

The present study was designed to identify the factors that best predict self-reported depressed mood in adolescents. The risk factors associated with being depressed are fairly known for adults. However, the risk factors associated with depression in adolescents have not been thoroughly investigated (Lewinsohn et al., 1994). The present study is important given the increasing prevalence of depression in adolescents and its negative outcomes.

It is reported that 24% of adolescents experience a Major Depressive Episode by the age of 24 (Paunesku et. al., 2008). This can seriously impair one's psychosocial development and well-being, as adolescence is a crucial period in which socialization and educational development take place (Newman, Newman, Griffen, O'Connor, & Spas, 2007; Paunesku et. al., 2008). Depression in adolescence has been associated with reduced educational attainment, relationship dysfunction, job absenteeism, substance abuse (Paunesku et. al., 2008), delinquency, unemployment, medical hospitalization, car accidents, arrests, criminal conviction (Lewinsohn et al., 1994) and the onset of other disorders (Cichhetti & Toth, 1998). Furthermore, depression symptoms often reoccur and persist into adult life (Cichhetti et al., 1998; Yang, Chiu, Soong, & Chen, 2008).

Although there is a high rate of depression, 70% to 80% of depressed teenagers never receive treatment (Cicchetti et al., 1998). The lack of treatment is especially problematic given the increase of suicide in adolescents. The annual worldwide suicide rate per 100,000 people in 2008 for boys and girls aged 5 to 14 was 0.9 and 0.5, respectively. For older adolescents, 15 to 24 years old, the rate of suicide was 14.2 for boys and 12.0 for girls. Moreover, a study of adolescent suicide victims indicated that

Major Depressive Disorder and Depression Not Otherwise Specified predicted 47.3% of completed suicides (Renaud, Berlim, McGirr, Tousignant, & Turecki, 2008). Other researchers go as far as proclaiming that depression is the third leading cause of death among older adolescents (Paunesku et. al., 2008). Given these negative outcomes, it is important to determine the factors that predict adolescent depression so that prevention and intervention measures can be developed.

Before identifying possible predictors of adolescent depression, it is first necessary to understand how depression is defined. Depression can be defined in three different ways: depressed mood, depressive syndromes, and clinical depression. Depressed mood includes feelings of sadness or unhappiness and is typically measured through self-reports of one's emotions. No assumptions are made about other symptoms that may also occur with a depressed mood (Petersen et al., 1993). Depressed mood also does not have to occur for a specified amount of time and is of trivial or modest severity (Parker, Wilhelm, & Asghari, 1998). On the other hand, depressive syndromes are viewed as a combination of emotions and behaviors that occur together in a pattern, including feeling lonely, sad, fearful, guilty, unloved, worthless, crying, worrying, needing to be perfect, and believing others are out to get him or her.

Lastly, clinical depression refers to a diagnosis determined by meeting a series of categorical criteria, most commonly found in the Diagnostic and Statistical Manual, Fourth Edition- Text Revision (DSM-IV-TR) and classified as Major Depressive Disorder (Petersen et al., 1993). This diagnostic manual defines Major Depressive Disorder as having one or more Major Depressive Episodes consisting of at least two weeks of depressed mood or loss of interest, as well as at least four additional symptoms

of depression. These additional symptoms can include significant weight loss or weight gain; insomnia or hypersomnia; psychomotor agitation or retardation; fatigue or loss of energy; feelings of worthlessness or excessive/inappropriate guilt; diminished ability to think, concentrate, or make decisions; and recurrent thoughts of death, suicidal ideation, or suicide attempts (American Psychiatric Association, 2000). In this study the definition of Major Depressive Disorder is used because of its precise criteria and clinical usage (Brown, Di Nardo, Lehman, & Campbell, 2001; Hilsenroth, Baity, Mooney, & Meyer, 2004).

Although the DSM-IV-TR definition of Major Depressive Disorder presents common features of the disorder that are found across all ages (Mitchell, McCauley, Burke, & Moss, 1988; Luby et al., 2003), there are some depressive features that are associated specifically with particular age groups. For instance, depression in young children is often accompanied by such things as school refusal, separation anxiety (Mitchell, Varley, & McCauley, 1988), and destructive or suicidal play themes (Davis, 2005). On the other hand, adults who are depressed are more likely than other age groups to have terminal insomnia and morning depression (Mitchell, McCauley, Burke, & Moss, 1988), somatic symptoms (Goldberg, Breckenridge, & Sheikh, 2003; McBride & Abeles, 2000; McNiel & Harsany, 1989), and increased cognitive impairment (McBride & Abeles, 2000).

In contrast, depressed adolescents often have more irritable moods as opposed to sad moods. This includes things such as persistent anger, a tendency to respond to events with angry outbursts or blaming others, and an exaggerated sense of frustration over minor matters. Adolescents are also more likely to have higher levels of psychomotor

retardation, hypersomnia, and delusions. Depression in adolescents is frequently linked with Attention Deficit Hyperactivity Disorder, Anxiety, Substance Related Disorders, and Eating Disorders (American Psychiatric Association, 2000). Greene et al. (2002) also reports that more than 50% of students with severe major depression have Oppositional Defiant Disorder (a disorder related to loss of temper, arguing with others, being angry and resentful, and being spiteful or revengeful) and Conduct Disorder (a disorder where one is aggressive toward people and animals, destroys property, has deceitfulness or theft, and violates rules). Similar to adults, pain symptoms have also been found in depressed adolescents; specifically headaches, stomach-aches, low back pain, and neck or shoulder pain have been found to be predictive of adolescent depression (Härmä, Kaltiala-Heino, Rimpelä, & Rantanen, 2002). Lastly, decreased concentration, social withdrawal, helplessness, and hopelessness are also reported as common features of depressed adolescents (Crowe, Ward, Dunnachie, & Roberts, 2006).

As stated earlier, 24% of adolescents experience a Major Depressive Episode by the age of 24 (Paunesku et al., 2008), which is a prevalence rate higher than childhood and adult depression. Perhaps the reason for such a high prevalence in adolescents is because of the critical intrapersonal and interpersonal changes that take place at this age. During this time, adolescents are experiencing physiological and hormonal changes, educational and environmental changes, and changes in their relationships with their family and peers (Newman et al., 2007; Paunesku et al., 2008; Tram & Cole, 2006). All of these aspects are important to consider when conceptualizing the importance of studying depression in adolescents.

In addition to understanding what depression in adolescents looks like, one also needs to understand the theoretical explanation of the development of adolescent depression. In other words, what is the pathway to adolescent depression? In the present study, the biopsychosocial model is used to explain how adolescent depression develops. This model states that biological, psychological, and social factors affect one another and are related to the likelihood of depression developing. The biological aspect of the model refers to one's genetics, or things outside of one's control. This includes one's gender, age, and developmental level, as well as disturbances of one's biochemical, neuroendocrine, immune, or chronobiological systems. The psychological part of the model refers to things such as one's thought patterns, intelligence, temperament, personality, affective regulation, motivation, self-esteem, attachment, social skills, coping styles, and health behaviors. Health behaviors can include things such as substance use, risky behavior, nutritional diet, and physical activity. Lastly, the social part of this model refers to environmental factors, including such factors as value systems, relationships with others, race, culture, and socioeconomic status (Kaslow et al., 2007). The biopsychosocial model emphasizes that all three parts of the model influence one another, impacting the likelihood of developing depression (Kaslow et al., 2007; Schotte, Van Den Bossche, De Doncker, Claes, & Cosyns, 2006). This is often referred to as a "negative spiral", where the biological, psychological, and social factors reinforce one another and push an individual further and further into depression (Schotte et al., 2006). Figure 1 shows a graphical representation of the model.

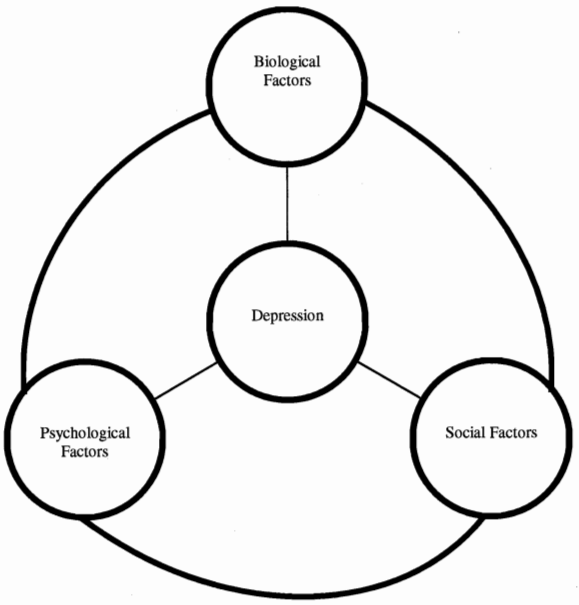

Figure 1. The biopsychosocial model of adolescent depression.

This theory is used in the present study due to its comprehensive and integrative nature. Many other theories of depression focus on one specific type of variable (i.e., only a biological, psychological, or social component of the disorder). However, the biopsychosocial model recognizes the complexity of the disorder and points out that it is not easy to pinpoint one sole predictor of depression. Instead, this theory is more comprehensive and reflects the literature which indicates that many variables contribute to depression by interweaving with one another (Schotte et al., 2006).

Given the above discussion, the following sections present empirical support for how several individual biological, psychological, and social variables are uniquely related to depression in adolescents. Upon understanding the individual variables and their associations with depression, one can then apply the biopsychosocial model and determine the best predictors of depression among various factors that influence one

another. Specifically, the present study follows the biological, psychological, and social variable classifications outlined by Kaslow et al. (2007).

Biological Variables Related to Depression in Adolescents

Gender. One of the most researched variables associated with depression in adolescents is the biological factor of gender. Numerous studies indicate that there is a gender difference in depressed adolescents, with female adolescents being more likely to be depressed than male adolescents (Eshbaugh, 2008; Galambos, Leadbeater, & Barker, 2004; Hankin, Mermelstein, & Roesch, 2007; Hanson et al., 2008; Hyde et al., 2008; Li, DiGiuseppe, & Froh, 2006). For instance, Galambos et al. (2004) conducted a longitudinal study to investigate these gender differences. The results of the study indicated that girls were significantly more symptomatic of depression than boys across a four year span.

There are several different explanations for why this gender effect exists. An extensive review by Hyde et al. (2008) examined numerous recent studies and integrated the findings to create a comprehensive, research-based model that combines affective, biological, cognitive, and negative life events to explain this gender difference. The model proposes that there are multiple pathways leading to female depression, and that affective (personality style and temperament), biological (genetic influences, hormones involved in puberty, and pubertal timing), and cognitive vulnerabilities (negative cognitive style, rumination, and objectified body consciousness) combine with negative life events (sexual abuse, interpersonal events, and pressure to conform to gender roles) to lead to depression.

Other studies have not integrated nearly as much research as Hyde et al. (2008) and tend to focus on just one specific pathway explaining why girls have higher rates of depression. Many of these studies focus particularly on negative life events and cognitive factors. For instance, Hankin et al. (2007) discuss the "stress exposure model" and the "stress reactivity model". The stress exposure model suggests that girls experience more stressors than boys, thus leading to higher rates of depression in girls. On the other hand, the stress reactivity model suggests that girls respond to stressors with more depressive symptoms than boys. Li et al. (2006) further explain why girls may respond differently to stressors, stating that girls use more emotion-focused coping (using one's emotions for dealing with a stressor), which is associated with higher degrees of depressive symptoms, whereas boys tend to use more problem-focused coping (dealing directly with the stressor). Likewise, Compas, Orosan, and Grant (1993) state that this emotion-focused coping leads women to devote a high level of attention to their emotions from the stressor, called rumination, which is hypothesized to be related to more depression. However, men are more likely to distract themselves or turn away attention from their depressive emotions experienced from the stressor. Although other studies focus specifically on other pathways leading to higher rates of female depression, a further discussion is beyond the scope of this study. Next, another biological variable related to depression, race, is examined.

Race. Different studies show conflicting results about the relationship between race and depression. Brown, Meadows, and Elder's (2007) study showed that Hispanic and Asian adolescents had the highest levels of depression, followed by African Americans, and finally Caucasians. However, Kublik, Lytle, Birnbaum, Murray, and

Perry (2003) indicated that Native American adolescents had the highest rate of depression, followed by Asians, African Americans, Hispanics, and finally Caucasians. Further, Twenge and Noeln-Hoeksema (2002) showed that there were no differences in depression between African Americans and Caucasians, but that Hispanics had more depressive symptoms than both African Americans and Caucasians. On the other hand, additional research has found no significant differences in adolescent depression among several races (Pumariega, Johnson, Sheridan, & Cuffe, 1996; Santana, Almeida-Filho, Roberts, & Cooper, 2007). Together, these studies are inconclusive and contradictory. Therefore, it is not logical to include an explanation of why a possible relationship between race and depression exists.

In summary, whereas it is widely supported that female adolescents have higher rates of depression than male adolescents do, there is no conclusive data to support racial differences in depression in adolescents. Further, although there are many studies that examined the relationship between gender and race with depression in adolescents, it is important to note that these studies simply establish a connection between the individual biological variables and depression in adolescents, and ignore the influence of other predicting variables. This is very similar to past research on psychological variables related to depression in adolescents, as described next.

Psychological Variables Related to Depression in Adolescents

School Belonging. School belonging is defined as the connectedness one feels to his or her school, which includes one's perception of fitting in and belonging with others in the institution (Pittman & Richmond, 2007). Feelings of not belonging in school have been found to be specifically associated with depression in adolescence (Andermen,

2002; Mounts, 2004; Newman et al., 2007). For instance, Andermen (2002) measured both individual students' perceptions of school belonging and aggregated school belonging through surveys. Results indicated that individual students' perceptions of belonging were inversely related to depression, but aggregated belonging was not significantly related to depression. On the other hand, some literature also indicates that students who have perceptions of school belonging report lower levels of internalizing and externalizing behaviors, as well as a more positive self-worth (Pittman & Richmond, 2007), which may protect them from depression.

Additionally, it has been said that participation in structured extracurricular activities in school, such as sports team or clubs, can help establish a sense of belonging because it encourages identification with the school (Gerber, 1996; Mash, 1992 as cited by Gilman, Meyers & Perez, 2004, p. 33). Thus, it would be expected that those participating in school activities would be at a lower risk for depression. Studies have supported this idea, indicating that adolescents that participated in structured extracurricular activities had greater life satisfaction (Maton, 1990 as cited by Gilman et al., 2004, p. 35) and those who played school sports were less depressed than those who did not (Donaldson & Ronan, 2006). In addition, Sabo, Miller, Melnick, Farrell, and Barnes (2005) found that high school students on sports teams were less likely to have suicidal ideation than those who were not athletes.

School belonging is likely linked with depression because of the beliefs and feelings that school belonging create in an individual. When one has a stronger sense of school belonging, he or she is likely to have more positive beliefs and emotions during school, which then relates to a more positive youth development. However, it is also

possible that the direction of the relationship between school belonging and depression is reversed, and that those who are depressed tend to have negative perceptions of their school belonging (Pittman & Richmond, 2007). Further research may want to identify the directionality of this relationship.

Academic Achievement. Academic achievement is defined as how one performs in school, and has been measured by past research in several ways. Whereas some studies have used only objective measures, such as grades, to indicate academic achievement, others have used subjective measures, such as self-reports from adolescents or reports from others (i.e., teachers, parents, peers) to indicate the child's academic achievement. Numerous studies have found a relationship between academic achievement and depression (Cole, 1990; Frojd et al. 2008; Schwartz, Gorman, Duong, & Nakamoto, 2008; Undheim & Sund, 2005). Cole (1990) examined the academic competence of students and its relationship to depression. The constructs were measured by self-reports, peer nominations, and teacher ratings. Results indicated that children with less academic competency had more symptoms of depression on self-report measures and teacher ratings than those who were reportedly more academically competent. In addition, it has been found that dissatisfaction with school grades predicts depression (Lewinsohn et al., 1994) and students who fear negative outcomes (i.e., failure at school) are vulnerable for depression, especially students with learning disabilities who may not perform the same as their peers (Sideridis, 2007).

This relationship between academic achievement and depression is likely explained by the negative view that children with low academic achievement have of themselves after being given negative academic feedback. These children may perceive

themselves as less competent and make negative overgeneralizations about themselves, placing them at risk for depression (Cole, 1990). However, it is also possible that depression occurs first, leading to poor academic achievement. This may be due to several symptoms of depression, such as impaired ability to concentrate and loss of interest, which may disturb cognitive performance and motivation to learn (Frojd et al., 2008).

Substance Use. Substance use is defined as the intake of any chemical or drug. The pattern of usage is usually specified in terms of frequency and quantity. Typically, it is thought that the greater the frequency or the quantity of substance intake, the greater the relationship to depression. The study of substance use in relation to depression in adolescents is very important because in 2005, 43.3% of adolescents drank alcohol and 20.2% of adolescents used marijuana during the past month (Centers for Disease Control and Prevention, 2006).

A relationship between substance use and depression in adolescents has been found across numerous different substances. Hallfors, Waller, Bauer, Ford, and Halpern (2005) found several results in their study. In this study, adolescent participants were interviewed twice in one year. Results of multivariate logistic regression analyses showed that high risk drug behavior (specifically cigarettes, alcohol, marijuana, and other illicit drugs) at the first point in time predicted an increased likelihood of depression at the second point in time. Other substances found to be related to adolescent depression are both prescription and over the counter medication, such as pain relievers and cold medication, respectively (Steinman, 2006). A complete list of substances related to adolescent depression in presented in Table 1.

Two common explanations for the relationship between substance use and depression exist: a casual explanation and a shared etiologic explanation. The casual explanation states that the occurrence of depression is elicited by substance use or vice versa. This is further broken down into direct and indirect relationships. A direct relationship is one where the primary problem could cause the secondary problem (e.g. depression occurring from the pharmacological effects of the substance). An indirect relationship is one in which the secondary effects of the primary problem causes the other problem (e.g. self-medicating oneself with alcohol to alleviate depressive symptoms). On the other hand, the shared etiologic explanation states that both depression and substance use share common etiological factors, such as a genetic predisposition, exposure to prenatal environmental factors, biologic environmental risk factors, and/or nonbiologic environmental risk factors (i.e., family/peer relationships, school environment, etc.) (Kelder et al., 2001; Swendsen & Merikangas, 2000). Given the complexity of substance use, it is difficult to determine what truly explains the relationship between depression and substance use.

Risky Sexual Behaviors. It is important to study risky sexual behaviors in relation to depression in adolescents, as almost half (47%) of adolescents surveyed in 2005 reported having intercourse (Centers for Disease Control and Prevention, 2006). For the present study, risky sexual behaviors describes one engaging in sexual intercourse at an early age, having multiple sexual partners, not using contraception, having sexually transmitted diseases, and being pregnant.

The literature shows that depression is associated with risky sexual behaviors among adolescents (Hallfors et al., 2004; Hallfors et al., 2005; Rector, Johnson, & Noyes,

2003; Riittakerttu, Konsunen, & Rimpelä, 2003; Waller et al., 2006). Particularly, early sexual behaviors are associated with depression (Monahan & Lee, 2008, Riittakerttu et al., 2003). Furthermore, it has been found that distressed adolescents are more likely to have multiple sexual partners (DiClemente, Wingood, Crosby, Sionean, & Brown, 2001; Konsunen, Kaltiala-Heino, Rimpela, & Laippala, 2003), less likely to use protection or contraception during intercourse (Brooks, Harris, Thrall, & Woods, 2002; DiClemente et al., 2001; Konsunen et al., 2003), and more likely to become pregnant (DiClemente et al., 2001). In addition, the presence of sexually transmitted diseases is also associated with depression (Shrier et al., 2002, as cited by Hallfors et al., 2005, p. 164). One study by Konsunen et al. (2003) illustrates several of these factors. In this study, questionnaires were administered to examine risky sexual behaviors and their relationship with self-reported depression in adolescents. The results indicated that both male and female participants reported more depression if they had more sexual partners and did not use contraception. In fact, participants who did not use contraception were nearly twice as at risk for depression than those participants that used contraceptives.

Little research has been conducted to establish why this relationship between risky sexual behaviors and depression exists; however, there has been some speculation. One thought is that adolescents may become depressed following sexual behaviors because the event took place before they were emotionally ready for it, due to peer pressure or the media influencing their decision. This can lead to regret and other negative feelings, thus leading to depression. On the other hand, adolescents who are depressed may seek out sexual behaviors as a way of establishing closeness with others and gaining acceptance, also explaining why there is a relationship between sexual

behaviors and depression (Riittakerttu et al., 2003). More research is needed to determine the direction of the relationship between risky sexual behaviors and adolescent depression.

Gambling. A psychological variable related to depression in adolescents that is not often studied is gambling. The present study uses Bolen and Boyd's (1968) definition of gambling, which is "placing value upon a game/event or a bet of any type that has an unpredictable outcome, and in which the result to some magnitude is determined by chance" (as cited by Raylu & Oie, 2002, p. 1010). It is important to consider gambling in relation to depression, given that Shaffer and Hall (1996), as cited by Lynch Maciejewski, & Potenza, 2004, p. 1116, reported that 50% to 90% of youths aged 12 to 17 years had engaged in gambling within the past year. Ten years later, adolescents have been found to engage in many kinds of gambling, including gambling in the lottery, on the race track, over sports or other games of skills, with card games, and over the internet (Ellenbogen, Derevensky, & Gupta, 2007).

Studies of adolescent gambling have found an association between those that gamble and depression (Ellenbogen et al., 2007; Lynch et al., 2004; Raylu & Oei, 2002). For example, Lynch et al. (2004) examined the relationship between gambling and other psychiatric variables by doing household telephone surveys. Logistic regression analyses showed that adolescent gamblers were more likely than adolescent nongamblers to report depression.

Although there is little research to explain why there is a relationship between gambling and depression in adolescents, there are a few hypotheses. One hypothesis is that those that are depressed use gambling as a way to escape their pain, whereas another

explanation is that financial losses or other adverse consequences from gambling lead one to become depressed. Finally, a common environmental or genetic factor may lead to the occurrence of both gambling and depression (Lynch et al., 2004).

Risky Behavior Causing Bodily Harm. Previous research indicates that depressed adolescents are more likely to engage in risky behaviors causing bodily harm. The present study defines risky behaviors causing bodily harm as not wearing a seatbelt or bike helmet, engaging in physical fights, and carrying weapons. This is important to study, because in 2005, 10.2% of adolescents nationwide reported rarely or never wearing a seat belt when riding in a car driven by someone else, 83.4 % had never worn a bike helmet, 18.5% carried a weapon, and 35.9% had been in a physical fight (Centers for Disease Control and Prevention, 2006).

Paxton, Valois, Watkins, Huebner, and Drane (2007) investigated risky behaviors by administering the Youth Risk Behavior Survey to adolescents. Results indicated that participants were more likely to be depressed if they engaged in high health risk behavior, such as physical fighting and weapon carrying. However, a limitation to this study is that depression was measured with only one question in the survey.

Although a relationship between risky behaviors causing bodily harm and depression has been indicated in some studies, most research does not provide an explanation for why the relationship exists. However, Yu et al. (2006) report that risk-taking behavior in general may give depressed youth the opportunity to develop an identity and independence, which can help foster a better self-image. In addition, risk behaviors may occur because depressed adolescents have a desire to seek acceptance from groups that are already engaging in these risk-taking behaviors. King et al. (2001)

also found that those involved in serious physical fights were at an increased risk for suicidal ideation or suicide attempts, likely due to a shared psychological or psychopathological risk factor that is responsible for both the suicidal ideation and the physical fighting.

Eating Disorder Symptoms. Yet another psychological variable related to depression in adolescents is eating disorder symptoms. Eating disorder symptoms refers to characteristics common of those with Anorexia Nervosa or Bulimia Nervosa in the DSM-IV-TR. For the present study, the particular symptoms that are addressed include negative body image, fasting, taking diet pills, vomiting, and/or taking laxatives to lose weight or to keep from gaining weight.

Rierdan and Koff (1997) define body image as the "individual, subjective sense of body" which is thought to reflect actual body structure and function, body-related experiences, social responses to body appearance, and sociocultural ideals of the body (Fisher, 1990 as cited by Rierdan & Koff, 1997, p. 615). Several studies have found that a negative body image is a risk factor for the development of depression in adolescent females (Bearman & Stice, 2008; Kostanski & Gullone, 1998; Reirdan & Koff, 1997; Stice, Hayward, Cameron, Killen, & Taylor, 2000). For instance, Kostanski and Gullone (1998) measured depression and perceived body image dissatisfaction through self report scales. Results indicated that these two constructs were positively correlated.

This relationship between depression and negative body image may be explained by the gender additive model of depression, which states that puberty distances girls from society's thin ideal of women, whereas puberty moves boys toward the ideal body for men. Because appearance is typically a concern for girls in the Western culture,

dissatisfaction with their bodies can have an adverse effect on their mood (Bearman & Stice, 2008). Furthermore, dissatisfaction with one's body decreases one's sense of self-worth, leading to depression (Wichstrøm, 1999).

Several other studies have established a relationship between other eating disorder symptoms and depression. Fasting, or the restriction of one's food intake, is a symptom of Anorexia Nervosa, a disorder that is associated with depression (García-Alba, 2004; Holtkamp, Müller, Heussen, Remschmidt, & Herpertz-Dahlmann, 2005; Salbach-Andrae et al., 2008). In fact, one study has even shown a link specifically between food insufficiency and depression in adults (Wu & Schimmele, 2005). In addition, vomiting one's food and taking laxatives, symptoms of Bulimia Nervosa, are also related to depression (Fischer & Grange, 2007; Hinz, 1987; Tomori & Rus-Makovec, 2000). Lastly, Patten (2001) found that taking diet pills, another symptom of an eating disorder, is associated with Major Depressive Episodes. It is hypothesized that these specific symptoms are also related to depression due to the shame and guilt that may occur from engaging in these behaviors (Stice et al., 2000).

Nutritional Diet. Depression has also been associated with a lack of nutrition in one's diet (not consuming the chemicals, typically through food, that one needs to live and grow). Brooks et al. (2002) support this observation; they found that a general healthy diet is a protective factor against depression in adolescent girls. Bamber, Stokes, and Stephen (2007) also report similar results, but do so in an extensive review of the literature reporting the relationship between depression and specific nutrients. This literature review notes that low levels of folate (a vitamin found in fruits such as oranges and vegetables such as broccoli) are associated with depression in adults. In addition,

Bamber et al. (2007) reported the results of studies by Penninx et al. (2000) and Bjelland et al. (2003), who found that low blood concentrations of vitamin B_{12} (a vitamin found in milk and other dairy products) is found in depressed individuals in comparison to non-depressed individuals. Although the above literature review demonstrates the relationship between depression and the low intake of some vitamins and minerals, the results of several of these studies are reported without specifying the methods of obtaining the results.

Researchers state that nutrient intake is associated with depression because nutrients are essential substrates for brain functions. Thus, a lack of nutrients is thought to influence neurotransmitter functioning or neuronal cells in the brain, which influence one's mood. In addition, a lack of nutrients is hypothesized to interfere with the effectiveness of antidepressant medication (Bamber et al., 2007).

Physical Activity. Physical activity is defined as bodily action that enhances or maintains one's fitness. Motl, Birnbaum, Kubik, and Dishman (2004) found that those who have lower levels of physical activity are more depressed. In this study, participants reported their frequency of physical activity and completed the Center for Epidemiological Studies Depression Scale (CES-D) over a two year period. Results indicated that as physical activity decreased, depressive symptoms increased, after controlling for other factors such as socioeconomic status, smoking, achievement, etc. Furthermore, adolescents who met the recommended levels of physical activity had fewer emotional problems a year later (Wiles et al., 2008).

Similarly, sedentary behaviors have been found to be associated with depression (Schmitz et al., 2002). For example, internet use (Kraut et al., 1998; Van Den Eijnden,

Meerkerk, Vermulst, Spijkerman, & Engles, 2008), more time spent watching television (Dittmar, 1994; Hammermeister, Brock, Winterstein, & Page, 2005), and more time spent on one's cell phone (Jenaro et al., 2007) are associated with depression.

One explanation for the relationship between physical activity and depression is that individuals who have low levels of physical activity likely have lower levels of serotonin in their brain, a neurotransmitter linked to depression and is found in many antidepressant medications (i.e., selective serotonin reuptake inhibitors). Several studies have found evidence that physical activity increases the level of serotonin in the brain (Martinsen, 2007; Young, 2007). In fact, some studies even recommend treating mild depression with an increase in exercise as opposed to antidepressant medications (Young, 2007). It is also possible that depression leads to inactivity (Martinsen, 2007), which is likely explained through the common symptoms of depression (i.e., lack of interest and psychomotor retardation) that may make one less likely to have high levels of physical activity.

Overall, it is evident from the above discussion that the literature supports the relationship between different psychological variables and depression in adolescents. However, like the biological variables discussed previously, the majority of the studies that indicate a relationship between psychological variables and depression in adolescents focus solely on the individual variables in question. In other words, the studies do not look at the many psychological variables simultaneously to determine which has the strongest relationship with depression in adolescents. Instead, the studies establish a relationship with one variable and depression in adolescents while ignoring the influence of other variables. This is a problem, given that the biopsychosocial model emphasizes

that the relationship between multiple variables lead to depression. This same problem is also seen in the literature investigating the relationship between social variables and depression in adolescents, discussed below.

Social Variables Related to Depression in Adolescents

Parental Involvement. Parental involvement is one individual social variable that is widely examined in relation to adolescent depression. The present study adapts Flouri and Buchanan's (2002) definition of parental involvement of "engagement (direct interaction with the child), accessibility or availability to the child, and responsibility for the care of the child". Results of previous studies have found that a low level of parental involvement is associated with a higher level of psychological distress (Cousins et al., 2007) and depression (Cookston & Finlay, 2006; Fröjd, Kaltiala-Heino, & Rimpelä, 2007). Likewise, distant relationships with parents are associated with adolescent depression (Cichhetti & Toth, 1998), and adverse relationships with one's mother and father are similar in their association with depression (Sheeber, Davis, Leve, Hops, & Tildesley, 2007). Moreover, adolescents are less likely to attempt suicide if they have parents with high involvement (Flouri & Buchanan, 2002).

The relationship between parental involvement and depression is likely explained by the fact that high parental involvement creates a positive atmosphere for the adolescent. However, a lack of nurturance, an important social factor, may make one vulnerable for psychological distress such as depression (Cousins, Bootzin, Stevens, Ruiz, & Haynes, 2007). Although there is less support for this idea, studies have also suggested the opposite effect, that internalizing problems in adolescents may elicit negative parental behavior in adults. In other words, over time the parents' tolerance of

the child's problem behavior increases, which decreases parental control attempts and the likelihood of parents acting responsive and warm because of the child's behavior (Reitz, Dekovi, & Meijer, 2006).

Dating Violence. Dating violence is a term that encompasses both physical violence (i.e., hitting or physically hurting another on purpose) and sexual violence. Campbell and Soeken (1999) define sexual assault as "an act of forced sex that includes sexual acts with actual violence or threats of violence" and sexual abuse as "other sexually related acts that are controlling, degrading, demeaning, and/or detrimental to women's health (physical and/or mental)". For the present study, sexual violence includes sexual assault and sexual abuse, as well as being emotionally pressured to perform a sexual act. The importance of studying dating violence is highlighted by the fact that 9.2% of students were physically hurt by their significant other and 7.5% were forced to engage in sexual intercourse in 2005 (Centers for Disease Control and Prevention, 2006). Many studies support that being a victim of dating violence is associated with depression in adolescents (Banyad & Cross, 2008; Buzi, Weinman, & Smith, 2007; Callahan, Tolman, & Saunders, 2003; Holt & Espealage, 2005). For instance, Banyard and Cross (2008) analyzed survey data and found that dating violence was related to negative outcomes, including depression.

It is hypothesized by Ackard and Neumark-Sztainer (2002) that dating violence is associated with depression in adolescents because adolescence is a period in which multiple developmental changes take place, all of which form an individual's self-concept. However, traumatic events such as dating violence interfere with stable development and may disrupt one's self-concept, trust within a relationship, and sense of

power and control of one's body, which can have negative psychological effects, such as depression. On the other hand, it is also possible that the relationship between these two variables is reversed and that those with more psychological distress are at an increased vulnerability to be a victim of dating violence (Callahan et al., 2003).

Cyberbullying. Cyberbullying is a recent social phenomenon that has been found to be related to depression in adolescents. Cyberbullying is defined by Mason (2008) as "an individual or a group willfully using information and communication involving electronic technologies to facilitate deliberate and repeated harassment or threat to another individual or group by sending or posting cruel text and/or graphics using technological means". The recent popularity of the topic of cyberbullying is largely due to the widespread use of the internet, as it has recently been estimated that 97% of people in the United States between the ages of 12 and 18 years old use the Internet (UCLA Center for Communication Policy, 2003 as cited by Ybarra, 2004, p. 248). Research varies in regards to the prevalence of cyberbullying, indicating that between 4 to 35% of adolescents have been victims (Klomek, Marroco, Kleinman, Schonfeld, & Gould, 2008). Although this topic is fairly new, a few studies have already found a relationship between cyberbullying and depression in adolescents (Klomek et al., 2008; Mason, 2008; Mitchell, Ybarra, & Finkelhor, 2007; Ybarra, 2004). For example, Ybarra (2004) surveyed adolescents and their caregivers via the telephone. Results indicated that individuals who were depressed were much more likely to have been cyberbullied than those who were not depressed.

The reason that cyberbullying is associated with depression in adolescents is likely due to the negative relationship that bullying has with one's self-concept (Klomek

et al., 2008). Thus, cyberbullying may lead one to develop a negative self-concept, which may lead to depression. However, it is also possible that the relationship exists in the opposite direction and that those who are depressed are simply at a greater risk to be victimized by cyberbullying (Ybarra, 2004).

Socioeconomic Status. Socioeconomic status (SES) is commonly defined as an economic and sociological measure based on one's income, education, and occupation. However, in the present study SES is measured by determining if the participant is eligible for free or reduced lunch. Eligibility for free or reduced lunch is determined by comparing a family's gross income to an income threshold. The income threshold is based on the federal income poverty guidelines and incorporates both income and household size. The federal threshold is then multiplied by 1.30 and 1.85 to determine the threshold for reduced lunch and free lunch, respectively (Department of Agriculture, 2008). Thus, if a family's income is below the threshold, the child is eligible for free or reduced lunch and considered to be low SES for the present study.

Several studies have found that students of low SES are at a greater risk for depression (Dubow, Lovko, & Kausch, 1990; Goodman, Slap, & Huang, 2003; Roberts, Roberts, & Chen, 1997; Wadsworth & Compas, 2002). For instance, Goodman (1999) administered parent and adolescent surveys and found that there is a linear association between having a lower income and attempting suicide. Despite the evidence demonstrating a relationship between SES and depression, MacPhee and Andrews (2006) found that when included in a model with other risk factors for depression in adolescents, SES was not a significant predictor.

Those studies that found SES to be associated with adolescent depression hypothesize that this relationship exists because those individuals with low SES experience more negative life events and adverse conditions, which can place demands on them that exceed their coping resources. For instance, children of low SES that live in poor neighborhoods may witness or be victimized by community violence, are less likely to play outside with other children, may be stigmatized by others, and may have less hope due to poor living conditions (i.e., no heat, insect infestation, etc.) (McLoyd, 1998).

In summary, the literature on social variables related to depression in adolescents is very similar to the literature demonstrating a relationship between biological and psychological variables and depression. Although the literature establishes a relationship between individual variables and depression, it does not acknowledge how relationships among multiple variables may relate to depression. Thus, it is difficult to determine which variables are the best predictors of depression in adolescents. A perfect example of this is SES. As reported above, numerous studies found a relationship between SES and depression in adolescents when looking exclusively at the social variable of SES. However, when MacPhee and Andrews (2006) examined SES in addition to other variables related to depression, SES was no longer a significant predictor of depression. This example shows that the relationship among numerous variables may change what factors are actually predictive of adolescent depression.

Taken as a whole, research has determined that all of the aforementioned biological, psychological, and social variables have some relationship with depression in adolescents. However, the current literature neglects to recognize that many variables predictive of depression may be present simultaneously, as stated in the biopsychosocial

theory. Paunesku et al. (2008) highlight that inconsistent results from previous studies suggest that our understanding of the variables related to depression are insufficient, and further studying these variables and how they are related to one another would aid in the development of prevention and intervention strategies. MacPhee and Andrews (2006) further support this idea and assert that many researchers feel that examining different factors simultaneously is the next step to understanding depression in adolescents (Bennett, Bendersky, & Lewis, 2002; Kessler, Avenevoli, & Merikangas, 2001; Muris et al., 2001 as cited by MacPhee & Andrews, 2006, p. 436).

There are a few studies that have attempted to study multiple variables simultaneously in relation to depression in adolescents. For instance, Field, Diego, and Sanders (2001) examined the variables of one's relationship with parents, relationships with peers, verbal intimacy and physical affection with parents, feelings of well-being and happiness, hours per week spent on working/homework/exercising, grade point average, and frequency of drug use. This study utilized the CES-D and an additional questionnaire and looked exclusively at psychological and social factors related to depression, excluding biological factors as possible predictors. Despite this limitation, Field et al. (2001) still contributed to research by identifying the strongest predictors of adolescent depression. Physical affection with parents accounted for 13% of the variance, followed by time spent on homework accounting for an additional 13%, feelings of well being (11%), engaging in exercise (5%), happiness (10%), and parent relations (3%). In total these variables accounted for 55% of the variance.

Paunesku et al. (2008) conducted a similar study in which they studied the most predictive factors of adolescent depression after a one-year follow-up. They included the

variables of family/interpersonal relations, self-emancipation, avoidant problem solving/low self-worth, and low religious activity. Similarly to the study by Field et al. (2001), this study assessed the variables through a survey and the CES-D and looked exclusively at psychological and social variables that might be predictive of depression in adolescents. Furthermore, this study originally assessed a greater multitude of variables and consolidated them all into categories using a factor analysis. By doing so, the study only took into consideration the broad, general factors that are predictive of depression instead of pinpointing which sub-variables within these factors are predictive of depression. For example, substance abuse, acting out, peer relations, and sexuality were all classified together as part of the factor self-emancipation, making it difficult to determine which of these sub-factors really were significant predictors of depression and which were not. Although this study had the potential to uncover more specific predictors of adolescent depression, the fact that it examined only general factors made further prevention and intervention efforts difficult. Regardless of the limitations, Paunesku et al. (2008) found that low family/interpersonal relations predicted depression at follow-up even when adjusting for sociodemographic/socioeconomic variables and baseline depressive symptoms.

Perhaps the study presenting the most beneficial data for predicting adolescent depression is the study conducted by MacPhee and Andrews (2006). This study also looked at multiple risk factors of adolescent depression concurrently to determine which factor would be the best predictor. Nine variables were examined through a self-report survey, including the variables of perceived quality of peer relationships, perceived parental nurturance, perceived parental rejection, self-esteem, body image, pubertal

status, SES, conduct problems, and hyperactivity/inattention. However, MacPhee and Andrews (2006) did not include some of the other psychological and social variables the other studies did that have demonstrated in research to be linked to depression in adolescents. Specifically, MacPhee and Andrews (2006) did not include the variables of academic achievement, substance abuse, risky sexual behaviors, and exercise. Despite this, the results of this study are still meaningful and add to previous research on adolescent depression. MacPhee and Andews (2006) found that self-esteem accounted for the most variance (31%), followed by hyperactivity/inattention (5%), parental nurturance (3%), parental rejection (2%), and conduct problems and peer relationships (each less than 1%). Results also showed that self-esteem partially mediated the relationship between parental nurturance and parental rejection and depression, and that parental nurturance mediated the relationship between SES and depression in females only.

Although the above studies include many different variables, all three studies neglected to include other factors that have been indicated in depression in adolescents, such as gender, school belonging, gambling, risky behaviors causing bodily harm, nutritional diet, dating violence, and cyberbullying. Given the various problems of the previous research, a more comprehensive study that simultaneously tests multiple variables to identify predictors of depression was still needed. Thus, the present study used data from *I Sing the Body Electric* to accomplish this task.

I Sing the Body Electric is a fine arts and health promotion coalition that measures adolescent health risks, including various predictors of depression. This program was started in 1998 and consists of three stages that take two years to complete. Upon completion of the three stages, the program starts all over again. The first stage of the

program is where the predictors of depression are measured. During this stage, students complete the Youth Risk Behavior Survey (YRBS) for East Central Illinois, which is based on the YRBS developed by the Centers for Disease Control. The second stage consists of students producing art projects that explore the health concerns indentified in phase one of the project (the survey). These art pieces are showcased at an Arts and Health Festival at the end of the year. Finally, in stage three of the program a tour is conducted where the art projects are brought to schools and communities within the region. Students also broadcast public service announcements in the area, and lesson plans are distributed to teachers to use during the tour to enrich the experience. The focus of the activities remains on the health risks identified in the survey in stage one of the program and preventative initiatives (*I Sing the Body Electric Regional Youth Risk Behavior Survey Report,* 2008).

Significance of the Study

The present study sought to further examine the best predictors of adolescent depression among many different variables using the *I Sing the Body Electric* YRBS data base. The findings of this study are especially important so that future preventative measures can focus on the factors that have the strongest relationship with depression. Furthermore, given that depression is an internalizing disorder and some of its symptoms are typically not manifested, recognizing the factors that best predict depression can increase attention to children at risk. As a result, parents and teachers would be able to monitor children to prevent depression and also intervene early if depressive symptoms appear.

The present study was also designed to avoid the pitfalls of previous research. Thus, this study aimed to follow the biopsychosocial theory and included biological, psychological, and social variables simultaneously. Furthermore, the present study sought to include the wide range of predictors mentioned previously, many of which have not been present in other studies that have examined multiple predictors of adolescent depression. Overall, the present study asked: What variables would best predict depression in adolescence?

It was hypothesized that the top two predictors of self-reported depressed mood in adolescents would be gender, followed by parental involvement. Gender was chosen as the top predictor because the relationship between gender and depression is fairly established, indicating that girls experience higher rates of depression than boys, as noted previously (Eshbaugh, 2008; Galambos, Leadbeater, & Barker, 2004; Hankin, Mermelstein, & Roesch, 2007; Hanson et al., 2008; Hyde et al., 2008; Li, DiGiuseppe, & Froh, 2006). In addition, depression has consistently been related to parental involvement. For example, Field et al. (2001), Paunesku et al. (2008), and MacPhee and Andews (2006) all found that when among other risk factors, parental factors were significant predictors of depression in adolescents. Thus, parental involvement was hypothesized to be the second best predictor of self-reported depressed mood.

Method

Participants

Participants were 4,693 students from various high schools in the largest rural geographic educational region in the state of Illinois. This included Clark, Coles, Cumberland, Douglas, Edgar, Moultrie, and Shelby counties in East-Central Illinois. Out

of the total sample, 2,185 (47%) were boys and 2,221 (47%) were girls. Six percent (295) did not indicate their gender. Participants consisted of students between the ages of 14 and 18 from various races (*I Sing the Body Electric Regional Youth Risk Behavior Survey Report,* 2008). Tables 2 and 3 present additional demographic information of participants.

Materials

Youth Risk Behavior Survey (YRBS). Each student completed the YRBS in 2008 during stage one of the *I Sing the Body Electric* program. The majority of the questions in the survey were taken from the Center for Disease Control's YRBS, which was developed to "monitor priority health-risk behaviors that contribute substantially to the leading causes of death, disability, and social problems" (Centers for Disease Control and Prevention, 2004). Selected questions were included to track core measures of youth risk behavior for the Substance Abuse and Mental Health Services Administration (SAMHSA), and additional questions were also added to meet local needs.

There were 148 total questions in the survey. Some questions were on a likert scale while others required a specific response out of two to 11 choices. Questions in the survey covered a variety of topics, including social relationships; substance use; school experiences; mental, physical, and sexual health; gambling, and so on. For instance, "How often do you spend time with your parents (or step-parents or guardians) talking and/or doing activities together in an average week?" with the response choices of "never, rarely, sometimes, and often" was a likert scale question. An example of a question that required a specific response was "During the past 12 months on how many sports teams did you play?" with response choices of "0 teams, 1 team, 2 teams, 3 or

more teams". All 148 items were not utilized for the present study. Only items that were related to the study variables were used. Those questions utilized were grouped according to what variable they measure. Participants' score for each variable were determined by assigning a score to each answer choice of the questions used (i.e., a question with the answer choices of yes or no were scored as yes = 1, no = 0). The scores for each question measuring one variable were added together to equal a total score for that variable. Higher scores indicated a higher level of a problem on the construct it is measuring (i.e., higher scores on dating violence reflected experiencing more dating violence).

Research investigating the reliability of the questionnaire has found adequate reliability. It is reported that three fourths of the items have a kappa of 60%-100% (Centers for Disease Control, 2004). Other psychometric properties of the survey have not been investigated.

Procedure

First, permission from the *I Sing the Body Electric* was sought to use the *I Sing the Body Electric* data base. Once approval was granted, recommendation was made to Sarah Bush Lincoln Health Center (SBLHC) for their approval of the study. When the consent for the study was received, data analysis began.

Data were collected after teachers and administrators in the participating high schools agreed to have employees from the *I Sing the Body Electric* program come into the school to administer the survey. Consent forms were then sent home to all parents with children under the age of 18. Participants that returned signed consent forms volunteered to take the survey after understanding that all information provided would remain confidential. Such demographic information as race, age, and gender were

collected without any identifying information, e.g., name or social security number. Participants completed the survey at school in groups during class periods, lunch, or study periods. The survey took between 30 and 45 minutes to complete. The *I Sing the Body Electric* staff members entered the data into SPSS.

Design and Data Analysis

This is a correlational study designed to determine the factors that best predict depression in adolescents. The dependent variable of the study was self-reported depression and it was measured by question 30. Question 30 asked, "During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?" This question is parallel with the DSM-IV-TR criteria for Major Depressive Disorder, as one of the criteria is at least two weeks of a depressed mood or loss of interest. Thus, the present study qualified one as being depressed if he or she responded "yes" to question 30. The 15 biological, psychological, and social variables previously discussed, with the exception of race, were the independent variables acting as predictors. Race was not included, as the majority of the sample (89%) was Caucasian (as presented in Table 3). In addition, the variable of substance use was broken down into categories in order to obtain more specific results. The categories included tobacco use, alcohol use, marijuana use, illicit drug use, prescription drug use, inhalant use, steroid use, and cold medication use. Furthermore, alcohol use and marijuana use were broken down into past 30 day use and lifetime use. A complete list of the independent variables can be found in Table 4. To see how each independent variable was assessed in the present study, refer to Appendix A.

Results

To analyze the data, frequency calculations were performed on the dependent variable, depression, to gain more information on the characteristics of depressed participants. Results indicated that 31.3% of the sample reported feelings of a depressed mood within the past 12 months. Of those that were considered depressed, 46.1% reported that they had seriously considered suicide, 35.3% indicated that they made a plan about how they would attempt suicide, and 24.8% attempted suicide at least one time during the past 12 months. Additionally, 23.7% of those that attempted suicide had an injury, poisoning, or overdose that had to be treated by a doctor or nurse as a result of their attempt. Furthermore, 25.7% of those who reported a depressed mood had anti-depressants prescribed to them by a doctor.

Additionally, frequencies and descriptive data were obtained on all independent variables. These results indicate that the majority of the participants in this study were not eligible for free or reduced lunch, were high academic achievers, and rarely used drugs or alcohol. Further, the overall sample engaged in little risky sexual behavior, gambling, or risky behavior causing bodily harm. The participants had moderate levels of physical activity, nutritional intake, and parental involvement. On the other hand, quite a number of students had eating disorder symptoms, had experienced dating violence, had been cyberbullied, or were depressed. Detailed frequencies and descriptive data are provided in Tables 5 and 6.

Pearson's correlation coefficients were also calculated as part of a preliminary analysis to identify associations among all variables. The results are presented in Table 7. Overall, results indicate that most of the variables are highly correlated with one another.

Due to this, a preliminary multiple regression analysis was conducted in order to examine multicollinearity among the predictors. The variable risky sexual behaviors was then removed from the analysis, as it had a tolerance level less than 0.1 and a variance inflation factor above 5, indicating multicollinearity. No other variables had to be removed from the analysis due to multicollinearity.

To answer the present study's research question, two logistic regression analyses using a forward selection procedure were conducted to examine how the independent variables predict depression. Two of these procedures were used so that one of the analyses included the variables of past 30 day marijuana use and past 30 day alcohol use, and the other analysis included lifetime marijuana use and lifetime alcohol use instead. This way, one can compare the results and see if when marijuana and alcohol were used makes a difference in predicting self-reported depressed mood in adolescents.

The first analysis included all of the independent variables except for past 30 day alcohol use and past 30 day marijuana use. Results show that dating violence, cyberbullying, eating disorder symptoms, school belonging, cold medication use, gender, academic achievement, lifetime alcohol use, nutrition, and SES accounted for 29.4% of the variance in depression, $\chi^2(10) = 685.54$, $p < .01$. Dating violence accounted for the most variance in depression (13.5%), $p < .01$. Those who had experienced more dating violence were significantly depressed and those who experienced less dating violence were not significantly depressed, $p < .01$. Cyberbullying accounted for the second most variance in depression (6.8%), $p < .01$. Those who had more experience being victims of cyberbullying were significantly depressed and those who had less experience being victimized were not significantly depressed, $p < .01$. This was followed by eating

disorder symptoms (2.6%), $p < .01$. Those who had experienced many eating disorder symptoms were significantly depressed and those who experienced less eating disorder symptoms were not significantly depressed, $p < .01$. Next, school belonging accounted for 2.4% of the variance in depression, $p < .01$. Those who reported low levels of school belonging were significantly depressed and those who had high levels of school belonging were not significantly depressed, $p < .01$.

The remaining variables in the final logistic regression model each accounted for less than 2% of the variance in depression. For instance, cold medication use was the fifth greatest predictor of depression, which accounted for 1.1% of the variance, $p < .01$. Those who used high levels of cold medication in the past 30 days were significantly depressed and those who used low levels of cold medication in the past 30 days were not significantly depressed, $p < .01$. Next, gender accounted for 0.8% of the variance in depression, $p < .01$, with females being significantly depressed and males not being significantly depressed, $p < .01$. This was followed by academic achievement, which accounted for 0.8% of the variance in depression, $p < .01$. Those who received mostly D's and F's were significantly depressed and those who received mostly A's, B's, and C's were not significantly depressed, $p < .01$. Next, lifetime alcohol use accounted for 0.5% of the variance in depression, $p < .01$. Those who consumed large amounts of alcohol in their lifetime were significantly depressed and those who consumed little alcohol in their lifetime were not significantly depressed $p < .01$. SES accounted for 0.5% of the variance in depression, $p < .01$. Those who were eligible for free or reduced lunch were significantly depressed and those who were not eligible were not significantly depressed, $p < .01$. Lastly, nutrition accounted for 0.4% of the variance in depression,

$p < .01$. Those who had high nutritional intake were significantly depressed and those who had low nutritional intake were not significantly depressed, $p < .01$. A summary of the results of the logistic regression analysis is found in Table 8.

The second analysis included all of the independent variables except for lifetime alcohol use and lifetime marijuana use. Results show that dating violence, cyberbullying, eating disorder symptoms, school belonging, cold medication use, gender, academic achievement, nutrition, SES, and alcohol use in the past 30 days accounted for 29.1% of the variance in depression, $\chi^2(10) = 679.86$, $p < .01$. Dating violence again accounted for the most variance (13.4%), $p < .01$. Those who had experienced more dating violence were significantly depressed and those who had experienced less dating violence were not significantly depressed, $p < .01$. This was also followed by cyberbullying (7%), $p < .01$, and those who had more experience being victims of cyberbullying were significantly depressed. Those who had less experience being victims of cyberbullying were not significantly depressed, $p < .01$. Next, eating disorder symptoms accounted for 2.6% of the variance in depression, $p < .01$. Those who had experienced many eating disorder symptoms were significantly depressed and those who had experienced little eating disorder symptoms were not significantly depressed, $p < .01$. School belonging accounted for 2.3% of the variance in depression, $p < .01$, and those who reported low levels of school belonging were significantly depressed. Those who reported high levels of school belonging were not significantly depressed, $p < .01$.

Similarly to the previous logistic regression analysis, the remaining variables in the final regression model each accounted for less than 2% of the variance in depression. Cold medication use was the next best predictor of depression, which accounted for 1.1%

of the variance, $p < .01$. Those who used high levels of cold medications in the past 30 days were significantly depressed and those who used low levels of cold medication in the past 30 days were not significantly depressed, $p < .01$. Gender accounted for 0.9% of the variance in depression, $p < .01$. Those who were females were significantly depressed and those who were males were not significantly depressed, $p < .01$. This was followed by academic achievement, which accounted for 0.7% of the variance in depression, $p < .01$. Those who received mostly D's and F's were significantly depressed and those who received mostly A's, B's, and C's were not significantly depressed, $p < .01$. Next, nutrition accounted for 0.4% of the variance in depression, $p < .01$. Those who had high nutritional intake were significantly depressed and those who had little nutritional intake were not significantly depressed, $p < .01$. SES accounted for 0.4% of the variance in depression, $p < .01$. Those who were eligible for free or reduced lunch were significantly depressed and those who were not eligible were not significantly depressed, $p < .01$. Lastly, alcohol use in the past 30 days accounted for 0.3% of the variance in depression, $p < .01$, with those who consumed large amounts of alcohol in the past 30 days being significantly depressed and those who consumed little alcohol in the past 30 days not being significantly depressed, $p < .01$. A summary of the results of the logistic regression analysis is found in Table 9.

Discussion

The primary purpose of this study was to identify the best predictors of adolescent depression out of the variables selected for this study. In other words, what variables best predict self-reported depressed mood in adolescents? It was hypothesized that gender would be the best predictor, followed by parental involvement.

Although gender was expected to be the best predictor of depression out of the variables selected, this hypothesis was not supported. The results of the logistic regressions indicate that gender only accounted for 0.8-0.9% of the variance in depression. This result may be due to the differences in how gender was identified as being related to depression in past studies in comparison to the present study. For instance, most previous studies have examined the relationship between gender and depression in one of two ways: by examining rates of depression in both boys and girls, and by examining the relationship between certain risk factors of depression and if boys or girls were more likely to have that risk factor. This literature is summarized well by MacPhee and Andrews (2006), who noted higher prevalence rates of depression in females than males, and that studies have specifically indicated particular risk factors to be related to depression in females. For example, negative body image has been linked to depression in female participants more strongly than in male participants. Because most studies of depression have examined gender similarly and found consistent results linking depression and risk factors of depression with females, it is widely accepted that being female puts one at great risk for depression. However, few studies have actually entered gender into a regression analysis to see if it is predictive of depression among other risk factors.

Additionally, gender may have only accounted for a small amount of variance in this study due to the association between gender and some of the top predictors of self-reported depressed mood. For instance, Marquart, Nannini, Edwards, Stanley, and Wayman (2007) found that adolescent females reported being victims of dating violence

more than adolescent males. Additionally, Greenberg and Schoen (2008) reported that eating disorders occur more in females than males.

Although it is unclear why gender only accounted for little variance in depression in the present study, the results still indicate an important finding: while depression is more likely to occur in girls (OR = 1.55), being female alone may not be the greatest predictor of depression and boys may be at risk as well. However, more research is still needed before making any conclusions.

Surprisingly, the second hypothesis, that parental involvement would be the second best predictor of adolescent depression, was not supported either. In fact, parental involvement was actually found to not account for any of the variance in depression when it was included amongst the variables in this study. Although one cannot be certain why the results of this study differ from previous studies in regards to the relationship between parental involvement and depression, one reason for this difference may be the way in which parental involvement was measured across different studies.

In the present study, the following questions were used to measure parental involvement: "How often do your parents work with you when you need help with your homework?"; "Do your parents limit the amount of time you can spend watching TV?"; "How often do your parents allow you to go out with friends on school nights?"; "How often do you spend time with your parents talking and/or doing activities together in an average week?"; and "My parents know who I'm with when I'm out of the house?" All of these questions measure parental involvement quantitatively instead of in qualitative terms. Although numerous studies have found a significant relationship between parental involvement and adolescent depression when using quantitative measures (Cookston &

Finlay, 2006; Flouri & Buchanan, 2002; Fröjd et al., 2007), typically those studies have solely examined the relationship between these two factors and have not included multiple risk factors together in the same model, as the current study has done. On the other hand, studies that did include multiple risk factors simultaneously, such as MacPhee and Andrews' (2006) study, measured parental rearing behavior using questions that assessed the adolescent's perceptions of parental nurturance and rejection, which tap into the qualitative perspective of emotional support.

It is important to note that Cookston and Finlay (2006) indicate that whereas some studies have found strong associations between the quantity and quality of parental interactions, others have not. There appears to be a distinction between them, with more research supporting a relationship between adolescent depression and parental involvement when measured in qualitative terms. In fact, some literature even indicates that particular emphasis should be placed on the quality of the parent-child relationship (Barnett, Marshall, & Pleck, 1992 as cited by Flouri & Buchanan, 2002). Thus, the results of the present study might not have shown a significant relationship between parental involvement and depression in adolescents because parental involvement was measured in quantitative terms instead of qualitative terms. Regardless, because the results of the present study are so contrary to existing literature, future research should continue to clarify this discrepancy.

Perhaps the biggest finding from the present study is that dating violence is the best predictor of self-reported depressed mood in adolescents among the variables examined in the present study. This finding is consistent with previous research indicating a relationship between dating violence and depression (Banyad & Cross, 2008;

Buzi, Weinman, & Smith, 2007; Callahan, Tolman, & Saunders, 2003; Holt & Espealage, 2005). One particular study that had similar results showed that being in an emotionally abusive relationship was the best predictor of seriously considering attempting suicide. Furthermore, attempted sexual penetration, sexual touching against will, or being in physically abusive relationships was also a significant predictive of seriously considering suicide (Kisch, Leino, & Silverman, 2005). This is consistent with the present study, adding some reliability and validity to the present results.

However, the question remains as to why dating violence is more predictive of self-reported depressed mood than the other variables in this study. As stated in the introduction section, the current study uses the biopsychosocial model to understand the pathway to adolescent depression. Dating violence fits into the social component of the model, as explained by Erik Erikson. According to Erikson, during adolescence social interactions with peers take on an increased importance. Specifically, romantic relationships grow to be more and more central in one's world (Furman, 2002). For instance, it has been found that 12th grade boys and girls spend five to eight hours a week thinking about members of the opposite sex when they are not with them (Richards, Crowe, Larson, & Swarr, 1998 as cited by Furman, 2002). These relationships act as a major source of support for adolescents, particularly fulfilling the needs of affiliation, companionship, and friendship (Furman, 2002) and according to Erikson, these relationships help one establish his or her identity. If one is not successful in this stage of development, the result may be what Erikson refers to as "role confusion". Thus, when these dating relationships that are so important to adolescents turn abusive, the impact

can be monumental: it can affect adolescents' self-concept, trust of others, and sense of power and control of one's body (Ackard & Neumark-Sztainer, 2002).

Furthermore, dating violence is experience even adults have difficulty talking about because of the shame involved with it. As a result, most victims suffer in silence. In fact, Molidor, Tolman, and Kober (2000) reported that 30% of victims have not told anyone about their experience with abuse, and 61% told a friend. Unfortunately, adolescents typically lack the experience in problem solving and communication skills necessary for handling dating violence on their own. Therefore, it makes sense that experiencing dating violence is strongly predictive of depression in adolescents.

Another important finding of the present study is the impact of cyberbullying, which was found to be the second best predictor of self-reported depressed mood in adolescents among the variables examined in this study. In fact, cyberbullying was found to be more predictive of depression in adolescents than many other variables that have been studied in relation to depression for decades. As explained previously, this relationship is likely due to the effect that the bullying has on one's self-concept (Klomek et al., 2008), making one at risk for depression. Like dating violence, cyberbullying is classified as a social variable within the context of the biopsychosocial theory and coincides with one of Erikson's developmental stages. Specifically, this illustrates Erikson's idea that during adolescence individuals attempt to find their own identity, struggle with social interactions, and grapple with moral issues (Identity vs. Role Confusion). At this critical period, cyberbullying can interfere with peer relationships and social interaction, which appear to be related to depression.

The finding that cyberbullying is a strong predictor of depression in adolescents in this study is significant given the recent proliferation of cyberbullying reported in the media and in research. This also supports the concerns of educators and parents. Given these, it is evident that more research is needed to shed more light on this new phenomenon, as well as to develop prevention and intervention measures.

Eating disorder symptoms were also found to be significant in this study. Given the vast literature establishing a relationship between eating disorder symptoms and depression (Bearman & Stice, 2008; Fischer & Grange, 2007; García-Alba, 2004; Hinz, 1987; Holtkamp et al., 2005; Kostanski & Gullone, 1998; Patten, 2001; Reirdan & Koff, 1997; Salbach-Andrae et al., 2008; Stice et al., 2000; Tomori & Rus-Makovec, 2000; Wu & Schimmele, 2005), it is not surprising that eating disorder symptoms were the third best predictor of self-reported depressed mood among the variables studied. In fact, the comorbidity between eating disorders and depression is even mentioned in the DSM-IV-TR (American Psychiatric Association, 2000). However, the present study does contribute to the literature because of the finding that among several other variables related to adolescent depression, eating disorder symptoms still emerges as one of the strongest predictors. This is an important finding, given that most previous studies did not examine if eating disorder symptoms were predictive of depression in adolescents within the context of other established predictors. The findings of the present study are also consistent with previous findings indicating that girls experience more eating disorder symptoms than boys, as 68% of the subjects presenting eating disorder symptoms were girls.

To understand the relationship between eating disorder symptoms and depression, the self-discrepancy theory suggests that individuals compare their actual image to an ideal image, which is often influenced largely by the media. This can lead them to believe they are not living up to their "ideal self" (Harrison, 2001). This realization can decrease one's self-worth and put him or her at risk for developing eating disorders and depression. This self-discrepancy theory is based upon the idea that adolescents feel the need to be similar to others and attempt to emulate those in the media, again highlighting the importance adolescents place on "fitting in" and being accepted by their peers. Furthermore, engaging in eating disorder symptoms elicits shame and guilt, which can also contribute to depression (Stice et al., 2000).

It was also not surprising to find that school belonging was the fourth best predictor of self-reported depressed mood in adolescents among the variables examined in this study. Previous research has consistently established a relationship between these variables, which the current study supports. As explained previously, this relationship exists because when one feels as if he or she belongs in school, this leads to positive feelings and subsequently positive youth development (Pittman and Richmond, 2007). Because school takes up a big part of adolescents' time, if adolescents experience negative feelings at school, it is only logical that over time these negative feelings place these students at risk for depression.

A surprising finding of the present study is that cold medication use is the fifth best predictor of self-reported depressed mood in adolescents among the variables examined in this study. This is unexpected, given that there is little research on recreational cold medication use in general and how it is connected to depression in

adolescents. Current research on cold medication indicates that using these medications to get high has increased among youth in the United States, as reported by the Students for Sensible Drug Policy and Child and Adolescent Workgroup of the National Institute on Drug Abuse in the USA (as cited by Lam & Shek, 2006). It appears as if there are several reasons why cold medicine may be abused by adolescents, including that it is cheap and readily available at pharmacies. Furthermore, because the effects of abusing cold medications are not as known as they are for other drugs, such as alcohol or marijuana, adolescents may think that it is safe. However, when used at high doses, cold medication can have similar effects to drugs such as PCP. This includes such symptoms as dry mouth and throat, warm feelings, inability to concentrate, disorientation, depersonalization, confusion, impaired coordination, agitation, distortions of motion or speech, and visual hallucinations (Schwartz, 2005). These effects are mostly attributed to the dextromethorphan in most cold medications.

Although this information is known about cold medication, very few studies have actually established a connection between cold medication use and psychological problems. However, there are some indications that recreational cold medication use is related to depression in adolescents. For instance, surveys of adolescents indicated that cold medication misuse and depressive affect were positively associated (Steinman, 2006). In addition, narratives of participants abusing cold medications indicated that they became socially isolated and withdrawn and had difficulty controlling their emotions (Lam & Shek, 2006). Furthermore, there have been instances reported of individuals that ingested high levels of dextromethorphan and subsequently developed mania-like psychosis, followed by depression, suicidal ideation, and insomnia (Hinsberger, Sharma,

& Mazmanian, as cited by Banerji & Anderson, 2001). Nevertheless, most of these reports are not based on data and only provide associations, not accounting for the directionality of the relationship between depression and cold medication use. These studies also do not include other predictors of depression in order to ascertain which predictors are most significant. Thus, the results of the present study are important and contribute to the scant literature on the subject. Not only do these results show that there is there a strong relationship between cold medication and depression based on the current data, but findings indicate that cold medication is even more predictive of depression than other known risk factors. It appears that this is the first study that has shown a relationship between cold medication and depression based on a large sample size. Because not much is known in this area, more research is needed to see if future studies find similar results and to understand the relationship between cold medication and depression in adolescents.

Unlike cold medication use, the finding that academic achievement is predictive of self-reported depressed mood among other risk factors is not unexpected and is consistent with previous literature. In other words, low academic achievement seems related to depression. This relationship may be based on the negative feedback adolescents receive when they are not achieving at the level they are expected to. Not only do many children develop negative views of themselves, but they may also get depressed (Cole, 1990). This result has important implications for teachers, school personnel (i.e., school psychologists, social workers, counselors), and parents, as it illustrates that poor grades may lead to more serious problems, such as depression. Thus,

parents and school personnel can play a key role in identifying and helping adolescents who are academically struggling before it becomes a bigger issue.

The last three variables, lifetime alcohol use/alcohol use in the past 30 days, nutrition, and SES showed different predictive strength in the two logistic regression models. Regardless of this, Nakelkerke values and odd ratios remained very similar for all variables between both models. These results indicate that drinking high levels of alcohol in one's lifetime is slightly more predictive of self-reported depressed mood than drinking high levels of alcohol in the past 30 days. Furthermore, because lifetime alcohol use is more predictive of depression than alcohol use in the past 30 days, when lifetime alcohol use was included in the analysis, nutrition and SES were less predictive of depression. However, when alcohol use in the past 30 days was included in the analysis, nutrition and SES were more predictive of depression than alcohol use in the past 30 days.

Overall, adolescents abusing alcohol for longer periods of time are more at risk for depression than those who only recently began abusing alcohol. This may be because high alcohol use for a long period of time is more indicative of a substance use disorder and a more chronic problem, whereas alcohol use in the past 30 days may be more situational, as adolescents binge drink for different reasons at different times. For instance, Greenbaum, Del Boca, Darkes, Wang, and Goldman (2005) found that alcohol use in late adolescence can be influenced by external contingencies such as school schedules and holidays. However, if adolescents are reporting high alcohol use across a long period of time, that certainly is a more reliable indicator of a problem and is more likely to be associated with depression. This is illustrated in the DSM-IV-TR, as it is

noted that substance use disorders (which must have symptoms occurring for 12 months) are comorbid with Major Depressive Disorder (American Psychiatric Association, 2000).

Regardless of how long the alcohol abuse has been going on, in both models alcohol use in general was found as a significant predictor of depression. Thus, the main finding is that no matter how long the alcohol use occurred, it is predictive of depression in adolescents. This is consistent with previous literature (Caldwell et al., 2002; Poulin, Hand, Boudreau, & Santor, 2005; Torikka, Kaltiala-Heino, Rimpelä, Rimpelä, & Rantanen, 2001). As stated previously, this relationship likely exists due to the pharmacological effects of alcohol, individuals with depression self-medicating themselves with alcohol, or a shared etiological factor for both alcohol use and depression (Kelder et al., 2001; Swendsen & Merikangas, 2000).

In addition to solidifying the relationship between alcohol use and depression, the present study also contributes to the body of literature supporting a relationship between SES and depression in adolescents. As mentioned previously, SES may be related to depression due to the negative life events and adverse living conditions that may occur because of having a low SES (McLoyd, 1998). However, in the present study SES only contributed to 0.4-0.5% of the variance in depression, indicating that it is a significant, but weak predictor. It would be beneficial for further research to continue to examine the relationship between SES and depression.

Similarly to SES, the present study found that nutrition only accounted for 0.4% of the variance in depression. As reported previously, nutrition may be related to depression because a lack of nutrients is thought to influence neurotransmitter functioning or neuronal cells in the brain, which influences one's mood (Bamber et al.,

2007). However, there is limited research supporting the relationship between nutrition and depression. Future research should continue to examine this relationship.

Thus far, the discussion has focused on those variables that are significant predictors of adolescent self-reported depressed mood. However, it is also equally as important to explore why some of the other variables were not found to significantly predict adolescent depression. In this study the variables of tobacco use, marijuana use, illicit drug use, and prescription drug use were not shown to predict self-reported depressed mood in adolescents. This may be because of the association between using these substances and exogenous life stressors such as poor academic achievement and difficulties with friends or romantic relationships (Kelder et al., 2001), all of which are measured to some degree in the present study and account for some variance in depression. Thus, the effect of using these substances may be accounted for by these other variables. However, future research should continue to clarify the relationships between these factors and depression.

Likewise, risky behavior causing bodily harm, gambling, and physical activity did not predict depression in this study. Thus, although these variables may be associated with depression, when entered into a regression model to determine which independent variables are the best predictors of depression, the predictive power of risky behavior causing bodily harm, gambling, and physical activity is limited. However, it is possible that physical activity was accounted for by the variable of school belonging: one of the questions that measured school belonging asks, "During the past 12 months on how many sports teams did you play?" Thus, future research should try and further investigate these two variables in order to clear up their relationships with adolescent depression.

Finally, as indicated earlier, a third of the sample (n = 1432) reported feelings of depressed mood almost every day for two weeks or more within the past 12 months; nearly a quarter of those reporting a depressed mood (n = 344) had anti-depressants prescribed to them by a doctor. Moreover, almost 50% (n = 659) of those who felt depressed had seriously considered suicide, and a quarter of them (n = 354) attempted suicide at least one time during the past 12 months. Further, almost a quarter of those who attempted suicide (n = 104) required some medical attention. These results support the use of the Major Depressive Disorder definition of depression in this study, as the DSM-IV-TR specifies that an individual must have one or more Major Depressive Episodes consisting of at least two weeks of depressed mood or loss of interest to have Major Depressive Disorder (American Psychiatric Association, 2000). Additionally, this profile of the sample demonstrates the seriousness of depression among adolescents, as the rate of depression and suicide attempts are slightly higher in this study than what is reported in the existing literature. As noted previously, it has been indicated that 24% of adolescents experience a Major Depressive Episode by the age of 24 (Paunesku et. al., 2008) and for adolescents between 15 to 24 years old, the rate of suicide per 100,000 people is 14.2 for boys and 12.0 for girls (Renaud et al., 2008). The higher rates of depression found in the present study (31.3 %) are somewhat alarming, given that the study's sample consisted of students between the ages of 14 and 18.

Although results of this study have meaningful implications as discussed later, a few limitations related to the issues of self-report, measurement of variables, sample size, and correlational studies exist. First, data were collected using self-report. Self-report is often suspect to social desirability or inaccurate recall of past events. Additionally, this

study classified participants as being depressed using the Major Depressive Disorder definition, which requires a third party expert diagnosis. However, the present study is only based on the self-report of depressed mood. Although this may appear contradictory, given that about a quarter of those who reported a depressed mood also reported receiving antidepressant medication or medical treatment for attempted suicide, the use of Major Depressive Disorders for identifying depression in the current sample is justified.

Secondly, there were limitations in the measurement of the study's variables due to using the existing data from the *I Sing the Body Electric* survey. One of these limitations includes that the survey items utilized were inconsistent in respect to the time frame they were measuring (behaviors occurring in the past 7 days vs. the past year or at any time in one's life). This could skew data results, as one is more likely to report higher numbers on questions assessing lifetime behaviors instead of recent behaviors. Additionally, because the data were previously collected by *I Sing the Body Electric,* the present study was limited in its scope and could only use what data were available. Along with this, although the biopsychosocial model was adopted to conceptualize depression, because of the variables included in the survey and the limited racial diversity of the sample, the only biological variable used in the present study was gender.

Furthermore, given the large sample size, it was difficult for any of the variables to account for a large amount of the variance in depression. Thus, the results of the present logistic regression analyses should be interpreted with this in mind. In addition, 89% of the sample was Caucasian and all were from the same rural area of Illinois. It is unknown if the same results would be seen across other races and other geographic areas.

Finally, the results of this study are correlational; one cannot infer causation. Likewise, the present study does not indicate how the variables interact with one another. Instead, it simply shows each variable's relative importance in relation to self-reported depressed mood in adolescents.

Implications and Future Research

There are many important implications of this study. First and foremost, this study identifies the variables that best predict depression in adolescents. Given that dating violence, cyberbullying, eating disorder symptoms, and school belonging emerged as the top four predictors, prevention, assessments, and interventions of depression in adolescents should focus on these factors. Because adolescents spend a significant part of the day in school, schools have a unique role in educating parents to discuss these issues with their children, develop prevention programs, and collaborate with community programs for referral purposes. Of additional importance is the fact that the four variables that best predict depression in adolescents (dating violence, cyberbullying, eating disorder symptoms, and school belonging) all focus heavily around one's relationship with peers and feelings of acceptance. This finding is extremely important, as it demonstrates the notion that one's peers and "fitting in" is important to those in this age group. As such, social skills training in intrapersonal and interpersonal relationships may be beneficial for adolescents.

Another significant contribution of this study is that it adds to the limited research that students who are cyberbullied are at risk for depression. Likewise, unique results that have not yet been indicated in the literature were found. For instance, cold medication use

was significantly predictive of depression in adolescents, a relationship that has not yet been supported with data until now.

In conclusion, future research in this area should continue to conclusively identify the variables that best predict depression in adolescents, as well as replicate this study using a large sample size of adolescents of different races and geographical locations. Furthermore, future research should rely on theory and past literature to expand on the variables included in the analysis (particularly with biological variables) and select appropriate tools to specifically measure these variables, as opposed to selecting an assessment tool first and basing the variables on the questions included. For consistency purposes, further studies should assess behaviors across the same time period as well. Additionally, a clinical diagnosis of depression should be used instead of self-reported depressed mood.

Future research should also attempt to identify the directionality of the relationship between the predictor variables and depression and investigate how the variables interact with one another. Lastly, future studies should link research results to practice and investigate effective, empirically-based prevention and intervention programs for the variables that best predict adolescent depression.

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Table 1

Summary of literature supporting the relationship between substance use and depression in adolescents

Substance	Literature
Alcohol	Caldwell et al. (2002) Poulin, Hand, Boudreau, and Santor (2005) Torikka et al. (2001)
Cannabis	Degenhardt, Hall, and Lynskey (2003) Fergusson, Horwood, and Swain-Campbell (2002) Medina, Nagel, Park, McQueeny, and Tapert (2007) Poulin et al. (2005)
Cocaine	Saluja et al. (2004)
Methamphetamine	Embry, Hankins, Biglan, and Boles (2009)
Inhalants	Kelder et al. (2001)
Opiates	Rao (2006)
Prescription medication, sedatives, tranquilizers, and cold medications	Bannerji and Anderson (2001) Steinman (2006)
Steroids	Pallesen, Jøendal, Johnsen, Larsen, and Molde (2006)
Hallucinogens	Kelly, Cornelius, and Lynch (2002)
Tobacco	Fergusson, Goodwin, and Horwood (2003) Morrell and Cohen (2006) Poulin et al. (2005)

Table 2

Age of participants

Age	Percent of Participants
14	8%
15	24%
16	26%
17	22%
18	13%
Other	7%

Table 3

Race of participants

Race	Percent of Participants
White	89%
Black	1.5%
Hispanic	1.9%
Asian	1.0%
American Indian	2.0%
Native Hawaiian/Pacific Islander	1.0%
Multi-racial	3.6%

Table 4

Biological, psychological, and social variables related to depression in adolescents

Biological	Psychological	Social
Gender	School Belonging	Parental Involvement
Race	Academic Achievement	Dating Violence
	Substance Use	Cyberbullying
	Tobacco Use	Socioeconomic Status
	Lifetime Alcohol Use/ Past 30 Day Alcohol Use	
	Lifetime Marijuana Use/ Past 30 Day Marijuana Use	
	Illicit Drug Use	
	Prescription Drug Use	
	Inhalant Use	
	Cold Medication Use	
	Steroid Use	
	Risky Sexual Behaviors	
	Gambling	
	Risky Behavior Causing Bodily Harm	
	Eating Disorder Symptoms	
	Nutritional Diet	
	Physical Activity	

Table 4

Frequencies for Categorical Variables

Variable	% Indicating No Problem	% Indicating a Problem
Depression	68.7	31.3
Academic Achievement	92.5	7.5
Socioeconomic Status	71.3	28.7

Table 5

Descriptive Data for Continuous Variables

Variable	Mean	Standard Deviation	Range of Scores
School Belonging			
Question 7	1.43	1.09	0-4
Question 110	1.16	1.13	0-3
Tobacco Use			
Question 38	1.01	1.98	0-6
Question 39	.80	1.50	0-6
Question 43	.50	1.44	0-6
Question 44	.35	2.13	0-6
Lifetime Alcohol Use			
Question 45	2.21	2.13	0-6
Alcohol Use the Past 30 Days			
Question 48	.86	1.38	0-6
Lifetime Marijuana Use			
Question 56	1.10	2.0	0-6
Marijuana Use the Past 30 Days			
Question 58	.51	1.27	0-5
Illicit Drug Use			
Question 61	.13	.69	0-5
Question 66	.12	.65	0-5
Question 71	.09	.57	0-5

Table 5 (continued)

Variable	Mean	Standard Deviation	Range of Scores
Question 73	.19	.75	0-5
Question 74	.13	.64	0-5
Prescription Drug Use			
Question 70	.26	.82	0-5
Inhalant Use			
Question 68	.14	.64	0-5
Cold Medication Use			
Question 69	.16	.67	0-5
Steroid Use			
Question 72	.22	.86	0-5
Risky Sexual Behaviors			
Question 87	2.16	2.53	0-7
Question 88	1.32	1.89	0-6
Question 91	1.31	1.65	0-7
Question 92	.15	.54	0-3
Question 93	1.04	.45	0-4
Gambling			
Question 79	.47	.87	0-3
Risky Behavior Causing Bodily Harm			
Question 10	.77	.82	0-5

Table 5 (continued)

Variable	Mean	Standard Deviation	Range of Scores
Question 12	3.17	1.14	0-4
Question 16	.61	1.33	0-4
Question 22	.77	1.53	0-7
Eating Disorder Symptoms			
Question 98	.86	.35	0-1
Question 99	.92	.28	0-1
Question 100	.91	.28	0-1
Nutritional Diet			
Question101	1.51	1.52	0-6
Question 102	1.66	1.42	0-6
Question 103	1.93	1.45	0-6
Question 104	2.42	1.85	0-6
Physical Activity			
Question 105	4.20	2.38	0-7
Question 106	3.35	2.6	0-7
Question 107	3.03	1.68	0-6
Question 109	3.12	1.79	0-7
Parental Involvement			
Question 141	1.38	1.15	0-3
Question 142	.63	.92	0-3
Question 143	1.86	1.07	0-3

Table 5 (continued)

Variable	Mean	Standard Deviation	Range of Scores
Question 144	1.70	1.01	0-3
Question 145	2.04	1.01	0-3
Dating Violence			
Question 25	.83	.37	0-1
Question 26	.87	.34	0-1
Question 27	.87	.33	0-1
Question 28	.40	.86	0-1
Cyberbullying			
Question 81	.68	.47	0-1
Question 82	.66	.47	0-1

Note. Higher scores indicate a higher degree of a problem (i.e., a high score on dating violence indicates more dating violence).

Table 6

Intercorrelations Between Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
									Students (n = 4,693)											
1. School Belonging	_	.28**	.15**	.14**	.22**	.18**	.14**	.14**	.11**	.04*	.11**	.11**	.01	.23**	.08**	.18**	.31**	.24**	.14**	.09**
2. Tobacco Use		_	.53**	.62**	.61**	.55**	.47**	.45**	.39**	.38**	.39**	.44**	.26**	.52**	.17**	.04**	.12**	.24**	.27**	.18**
3. Lifetime Alcohol Use			_	.68**	.57**	.42**	.24**	.31**	.19**	.22**	.26**	.53**	.27**	.41**	.20**	.02	.03*	.30**	..14**	.27**
4. Past 30 Day Alcohol Use				_	.53**	.51**	.41**	.44**	.35**	.32**	.38**	.43**	.28**	.46**	.20**	.01	.07**	.24**	.28**	.22**
5. Lifetime Marijuana Use					_	.76**	.37**	.41**	.28**	.26**	.32**	.46**	.18**	.35**	.16**	.05**	.11**	.26**	.24**	.18**
6. Past 30 Day Marijuana Use						_	.46**	.45**	.36**	.29**	.39**	.33**	.18**	.34**	.14**	.03**	.12**	.20**	.20**	.13**
7. Illicit Drug Use							_	.59**	.67**	.52**	.64**	.23**	.28**	.38**	.20**	.00	.13**	.09**	.27**	.13**
8. Prescription Drug Use								_	.54**	.38**	.68**	.25**	.24**	.33**	.20**	.01	.13**	.16**	.26**	.18**
9. Inhalant Use									_	.40**	.65**	.16**	.21**	.34**	.17**	.01	.13**	.09**	.26**	.14**
10. Steroid Use										_	.40**	.17**	.31**	.31**	.10**	-.02	.05**	.09**	.15**	.10**
11. Cold Medication Use											_	.20**	.23**	.32**	.32**	.21**	.00	.11**	.26**	.17**
12. Risky Sexual Behaviors												_	.19**	.30**	.15**	.03	.04**	.28**	.33**	.28**
13. Gambling													_	.35**	.01	-.06**	-.02	.13**	.05**	.08**
14. Risky Behaviors Causing Bodily Harm														_	.15**	.05**	.08**	.25**	.22**	.17**
15. Eating Disorder Symptoms															_	.06**	.12**	.18**	.31**	.27**
16. Nutritional Diet																_	.31**	.19**	.00	.02
17. Physical Activity																	_	.16**	.07**	.05**
18. Parental Involvement																		_	.17**	.20**
19. Dating Violence																			. _	.33**
20.Cyberbullying																				_

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 7

First Logistic Regression Analysis

Variable	*B*	*S.E*	*Wald*	*df*	*p*	Exp(β)
Dating Violence	.70	.04	264.54	1	.00	2.01
Cyberbullying	.70	.06	161.58	1	.00	2.01
Eating Disorder Symptoms	.53	.07	61.27	1	.00	1.69
School Belonging*	.20	.03	50.59	1	.00	1.21
Cold Medication Use	.62	.13	23.58	1	.00	1.86
Gender	.44	.10	20.65	1	.00	1.55
Academic Achievement**	.92	.21	20.25	1	.00	2.51
Lifetime Alcohol Use	.09	.02	14.71	1	.00	1.10
Nutrition***	-.04	.01	10.61	1	.00	.97
Socioeconomic Status****	.34	.10	10.87	1	.00	1.41

** High scores on this variable reflect low levels of school belonging.*
*** High scores on this variable reflect low levels of academic achievement.*
**** High scores on this variable reflect low levels of nutritional intake.*
***** High scores on this variable reflect eligibility for free and reduced lunch.*

Table 8

Second Logistic Regression Analysis

Variable	*B*	*S.E*	*Wald*	*df*	*p*	Exp(β)
Dating Violence	.70	.04	263.79	1	.00	2.01
Cyberbullying	.71	.06	163.91	1	.00	2.02
Eating Disorder Symptoms	.53	.07	61.62	1	.00	1.70
School Belonging*	.20	.03	57.24	1	.00	1.23
Cold Medication Use	.62	.13	23.40	1	.00	1.85
Gender	.44	.10	20.72	1	.00	1.55
Academic Achievement**	.92	.21	20.01	1	.00	2.50
Nutrition***	-.04	.01	10.59	1	.00	.97
Socioeconomic Status****	.33	.10	10.34	1	.00	1.39
Alcohol Use in the Past 30 Days	.06	.02	7.90	1	.01	1.06

** High scores on this variable reflect low levels of school belonging.*
*** High scores on this variable reflect low levels of academic achievement.*
**** High scores on this variable reflect low levels of nutritional intake.*
***** High scores on this variable reflect eligibility for free and reduced lunch.*

Appendix A

Questions used from the Youth Risk Behavior Survey

Independent Variable	Question Number	Question	Response Choices
Gender	N/A	N/A	Male Female
Race	1	What is your race?	Alaska Native Asian Black or African American Hispanic or Latino Native Hawaiian/ Pacific Islander White Multi-racial
School Belonging	7	Do you agree or disagree that you feel a sense of belonging to this school?	Strongly Agree Agree Not sure Disagree Strongly Disagree
	110	During the past 12 months on how many sports teams did you play?	0 teams 1 teams 2 teams 3 or more teams
Academic Achievement	5	During the past 12 months, how would you describe your grades in school?	Mostly A's Mostly B's Mostly C's Mostly D's Mostly F's None of these grades Not sure

Appendix A (continued)

Independent Variable	Question Number	Question	Response Choices
Substance Use			
Tobacco Use	38	During the past 30 days, on how many days did you smoke cigarettes?	0 days 1 or 2 days 3 to 5 days 6 to 9 days 10 to 19 days 20 to 29 days All 30 days
	39	During the past 30 days, on the days you smoked, how many cigarettes did you smoke per day?	Did not smoke Less than 1/day 1/day 2-5/day 6-10/day 11-20/day More than 20/day
	43	During the past 30 days, on how many days did you use chewing tobacco, snuff, or dip, such as Redman, Levi Garrett, Beechnut, Skoal Bandits, or Copenhagen?	0 days 1 or 2 days 3-5 days 6-9 days 10-19 days 20-29 days All 30 days
	44	During the past 30 days, on how many days did you smoke cigars, cigarillos, or little cigars?	0 days 1 or 2 days 3-5 days 6-9 days 10-19 days 20-29 days All 30 days

Appendix A (continued)

Independent Variable	Question Number	Question	Response Choices
Lifetime Alcohol Use	45	During your life, on how many days have you had at least one drink alcohol?	0 days 1 or 2 days 3-9 days 10-19 days 20-39 days 40-99 days 100 or more
Past 30 Day Alcohol Use	48	During the past 30 days, on how many days have you had at least one drink of alcohol?	0 days 1 or 2 days 3-5 days 6-9 days 10-19 days 20-29 days All 30 days
	49	During the past 30 days, on how many days did you have 5 or more drinks of alcohol in a row, that is, within a couple of hours?	0 days 1 day 2 days 3-5 days 6-9 days 10-19 days 20 or more days
Lifetime Marijuana Use	56	During your life, how many times have you used marijuana?	0 times 1 or 2 times 3-9 times 10-19 times 20-39 times 40-99 times 100 or more
Past 30 Day Marijuana Use	58	During the past 30 days, how many times did you use marijuana?	0 times 1 or 2 times 3-9 times 10-19 times 20-39 times 40 or more times

Appendix A (continued)

Independent Variable	Question Number	Question	Response Choices
Illicit Drug Use	61	During your life, how many times have you used Methamphetamine (also called speed, crystal, crank, or ice)?	0 times 1 or 2 times 3-9 times 10-19 times 20-39 times 40 or more times
	66	During the past 30 days, how many times did you use cocaine?	0 times 1 or 2 times 3-9 times 10-19 times 20-39 times 40 or more times
	71	During your life, how many times have you used heroin (also called smack, junk, or China White)?	0 times 1 or 2 times 3-9 times 10-19 times 20-39 times 40 or more times
	73	During your life, how many times have you used any other illegal drug such as LSD, PCP, mushrooms, or other hallucinogens?	0 times 1 or 2 times 3-9 times 10-19 times 20-39 times 40 or more times
	74	During your life, how many times have you used ecstasy (also called MDMA)?	0 times 1 or 2 times 3-9 times 10-19 times 20-39 times 40 or more times

Appendix A (continued)

Independent Variable	Question Number	Question	Response Choices
Prescription Drug Use	70	During the past 30 days, how many times did you take prescription pain killers or other prescription drugs that were not prescribed for you?	0 times 1 or 2 times 3-9 times 10-19 times 20-39 times 40 or more times
Inhalants Use	68	During the past 30 days, how many times have you sniffed glue, breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high?	0 times 1 or 2 times 3-9 times 10-19 times 20-39 times 40 or more times
Cold Medication Use	69	During the past 30 days, how many times did you drink cough syrup or swallow cold pills when you did not have a cold -- just to try to get high?	0 times 1 or 2 times 3-9 times 10-19 times 20-39 times 40 or more times
Steroid Use	72	During your life, how many times have you taken performance enhancing drugs (like creatine, ephedra, androstenedione, or steroids) without a doctor's prescription?	0 times 1 or 2 times 3-9 times 10-19 times 20-39 times 40 or more times

Appendix A (continued)

Independent Variable	Question Number	Question	Response Choices
Risky Sexual Behaviors	87	How old were you when you had sexual intercourse for the first time?	Never had intercourse 11 or younger 12 years 13 years 14 years 15 years 16 years 17 or older
	88	During your life, with how many people have you had sexual intercourse?	Never had sex 1 person 2 people 3 people 4 people 5 people 6 or more
	91	The last time you had sexual intercourse, what one method did you or your partner use to prevent pregnancy?	Never had intercourse No method used Birth control pills Condoms Depo-provera Withdrawal Other method Not sure
	92	How many times have you been pregnant or gotten someone pregnant?	0 times 1 time 2 or more times Not sure

Appendix A (continued)

Independent Variable	Question Number	Question	Response Choices
	93	During the past 12 months, has a doctor or other health professional told you that you had a sexually transmitted disease or infection (STD or STI) like herpes, gonorrhea, chlamydia, human paplloma virus or genital warts?	Yes No Don't know/Not sure Haven't been to a doctor or clinic in the past 12 months
Gambling	79	In the past 12 months, how many times have you gambled for money?	0 times 1-2 times 3-5 times 6 or more times
Risky Behaviors Causing Bodily Harm	10	When you rode a bicycle during the past 12 months, how often did you wear a helmet?	Did not ride Never wore Rarely wore Sometimes wore Most of the time Always wore
	12	How often do you wear a seat belt when riding in a car driven by someone else?	Never Rarely Sometimes Most of the time Always
	16	During the past 30 days, on how many days did you carry a weapon such as a gun, knife, or club?	0 days 1 day 2 or 3 days 4 or 5 days 6 or more days

Appendix A (continued)

Independent Variable	Question Number	Question	Response Choices
	22	During the past 12 months, how many times were you in a physical fight?	0 times 1 time 2 or 3 times 4 or 5 times 6 or 7 times 8 or 9 times 10 or 11 times 12 or more times
Eating Disorder Symptoms	98	During the past 30 days, did you go without eating for 24 hours or more (also called fasting) to lose weight or to keep from gaining weight?	Yes No
	99	During the past 30 days, did you take diet pills, powders or liquids without a doctor's advice, to lose weight or to keep from gaining weight? (do not include meal replacement products such as Slim Fast.)	Yes No
	100	During the past 30 days, did you make yourself vomit or did you take laxatives to lose weight or to keep from gaining weight?	Yes No

Appendix A (continued)

Independent Variable	Question Number	Question	Response Choices
Nutritional Diet	101	During the past 7 days, how many times did you drink 100% fruit juices such as orange juice, apple juice, or grape juice (not punch, Kool-Aid, or sports drinks)?	Did not have juice 1-3 times in 7 days 4-6 times in 7 days 1 time/day 2 times/day 3 times/day 4 or more times/day
	102	During the past 7 days, how many times did you eat fruit? (Do not count fruit juice.)	0 times 1-3 times in 7 days 4-6 times in 7 days 1 time/day 2 times/day 3 times/day 4 or more times/day
	103	During the past 7 days, how many times did you eat vegetables? (Do not count green salad.)	Did not eat vegetables 1-3 times in 7 days 4-6 times in 7 days 1 time/day 2 times/day 3 times/day 4 or more times/day

Appendix A (continued)

Independent Variable	Question Number	Question	Response Choices
	104	During the past 7 days, how many glasses of milk did you drink? (including milk you drank in a glass or cup, from a carton, or with cereal. (Count the half-pint of milk served at school as equal to one glass.)	Did not drink milk 1-3 glasses past 7 days 4-6 glasses past 7 days 1 glass per day 2 glass per day 3 glass per day 4 or more glasses per day
Physical Activity	105	On how many of the past 7 days did you exercise or participate in sports activities for at least 20 minutes, that made you sweat and breathe hard, such as basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities?	0 days 1 day 2 days 3 days 4 days 5 days 6 days 7 days
	106	On how many of the past 7 days did you participate in physical activity for at least 30 minutes that did not make you sweat and breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower or mopping floors?	0 days 1 day 2 days 3 days, 4 days 5 days 6 days 7 days

Appendix A (continued)

Independent Variable	Question Number	Question	Response Choices
	107	On an average school day, how many hours do you sit or lie down watching TV, using a computer, playing video games, using an iPod or telephone?	Not at all Less than 1 hour per day 1 hour per day 2 hours per day 3 hours per day 4 hours per day 5 or more hours per day
	109	During an average PE (physical education) class, how many minutes do you spend actually exercising or playing sports?	I don't take PE Less than 10 minutes 10-20 minutes 21-30 minutes 31-40 minutes 41-50 minutes 51-60 minutes More than 60 minutes
Parental Involvement	141	How often do your parents (or step-parents or guardians) work with you when you need help with your homework?	Never Rarely Sometimes Often
	142	Do your parents (or step-parents or guardians) limit the amount of time you can spend watching TV?	Never Rarely Sometimes Often
	143	How often do your parents (or step-parents or guardians) allow you to go out with friends on school nights?	Never Rarely Sometimes Often

Appendix A (continued)

Independent Variable	Question Number	Question	Response Choices
	144	How often do you spend time with your parents (or step-parents or guardians) talking and/or doing activities together in an average week?	Never Rarely Sometimes Often
	145	My parents (step-parents or guardians) know who I'm with when I'm out of the house.	Never Rarely Most of the time Always
Dating Violence	25	Have you ever felt afraid of your boyfriend or girlfriend?	Yes No
	26	During the past 12 months, did your boyfriend or girlfriend ever hit, slap or physically hurt you on purpose?	Yes No
	27	Have you ever been physically forced to have sexual intercourse when you did not want to?	Yes No

Appendix A (continued)

Independent Variable	Question Number	Question	Response Choices
	28	Have you ever been emotionally pressured, threatened, or physically forced to perform a sexual act when you did not want to?	Yes No
Cyberbullying	81	Has someone spread a rumor about you online, in a chat room, through a social networking site (facebook or myspace), in emails or through text messaging?	Yes No
	82	Has anyone ever sent you a threatening or aggressive email, instant message, or text message?	Yes No
Socioeconomic Status	4	At school, are you eligible to receive:	Free lunch and/or breakfast Reduced price lunch Neither

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